

2019

## MATHEMATICS

Full Marks – 80

Pass Marks – 20

Time : Three hours

Attempt **all** questions.

The figures in the right hand margin indicate full marks for the questions.

1. For any natural number  $n$ , the digital root of  $7^n$  cannot be: 1

$n$  ට  $7^n$  ඩිජිටල් රූපයක් සඳහා  $7^n$  ඩිජිටල් රූපයක්,  $7^n$  ඩිජිටල් රූපයක් සඳහා  $7^n$  ඩිජිටල් රූපයක්:

- (A) 1  
(B) 4  
(C) 6  
(D) 7

2. The pair of linear equations  $a_1x + b_1y + c_1 = 0$  and  $a_2x + b_2y + c_2 = 0$  is a dependent pair if: 1

සමාන්තර රේඛා සමාසයක්,  $a_1x + b_1y + c_1 = 0$  and  $a_2x + b_2y + c_2 = 0$  සමාස linear equation යුගයක් dependent රේඛා යුගයක් වේ :

- (A)  $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$   
(B)  $\frac{a_1}{a_2} \neq \frac{b_1}{b_2} = \frac{c_1}{c_2}$   
(C)  $\frac{a_1}{a_2} = \frac{b_1}{b_2} \neq \frac{c_1}{c_2}$   
(D)  $\frac{a_1}{a_2} = \frac{b_1}{b_2} = \frac{c_1}{c_2}$

Contd.

3. The 15<sup>th</sup> term of an AP exceeds the 22<sup>nd</sup> term by 35 ; the common difference of the AP is : 1

AP ਘੋਰਾ 15 ੁਣ term ੇ 22 ੁਣ term ਆ 35 ਡਾਵਰ; AP ਘੋਰਾ common difference ਆਗੇਰਾ :

- (A) -5  
(B) 5  
(C) -7  
(D) 7

4. The coordinates of the point which divides the line segment joining the points  $(x_1, y_1)$  and  $(x_2, y_2)$  internally in the ratio of  $m : n$  are : 1

$(x_1, y_1)$  ਘੋਰਾ  $(x_2, y_2)$  ਡੇਰਾ ਆਗੇਰਾ ੁਣ ੁਣ ੁਣ ੁਣ ੁਣ ੁਣ ੁਣ  $m:n$  ਆ ਆਗੇਰਾ, ਆਗੇਰਾ coordinate ੁਣ ਆਗੇਰਾ :

- (A)  $(\frac{mx_2 + nx_1}{m+n}, \frac{my_2 + ny_1}{m+n})$   
(B)  $(\frac{mx_1 + ny_1}{m+n}, \frac{mx_2 + ny_2}{m+n})$   
(C)  $(\frac{mx_2 - nx_1}{m-n}, \frac{my_2 - ny_1}{m+n})$   
(D)  $(\frac{mx_1 - ny_1}{m-n}, \frac{mx_2 - ny_1}{m-n})$

5. The circumference of a circle is 168 cm. If the sectorial angle of a sector of the circle is  $120^\circ$ , then the length of arc of the sector in cm is : 1

Circle ਘੋਰਾ circumference 168 cm ੇ || Circle ਘੋਰਾ sector ਘੋਰਾ sectorial angle  $120^\circ$  ਘੋਰਾ sector ਘੋਰਾ arc ਆ ਘੋਰਾ cm ਆ ਆਗੇਰਾ :

- (A) 55  
(B) 56  
(C) 54  
(D) 57

6. Write the nature of the roots of the quadratic equation  $ax^2 + bx + c = 0$  when its discriminant is negative. 1  
 $ax^2 + bx + c = 0$  තේරුම quadratic equation අග්‍රාංශ discriminant අරුත negative  
 අරුත සංඛේදන සංග්‍රහ root ග්‍රහාංශ සංඛේදන සංඛේදන නැත .
7. The  $n$ th term of an AP is  $5 - 3n$ . Can the sequence be an AP? 1  
 Sequence අග්‍රාංශ  $n$  ගුණ පදය  $5 - 3n$  ගේ . Sequence අග්‍රාංශ AP අරුත තේරුම ?
8. What is meant by a secant of a circle? 1  
 Circle අග්‍රාංශ secant අරුත තේරුම අරුත තේරුම ?
9. The sides of a triangle are 11 mm, 60 mm and 61 mm. State whether the triangle is a right triangle or not. 1  
 Triangle අග්‍රාංශ side ග්‍රහාංශ 11 mm, 60 mm අරුත 61 mm ගේ . Triangle අග්‍රාංශ  
 right triangle අරුත පරීක්ෂණ අරුත තේරුම .
10. Write a Pythagorean relation between the trigonometric ratios  $\sec A$  and  $\tan A$ . 1  
 $\sec A$  අරුත  $\tan A$  තේරුම trigonometric ratio අග්‍රාංශ සංඛේදන පේළි Pythagorean  
 relation අරුත නැත .
11. Find the value of  $\tan 35^\circ \tan 45^\circ \tan 55^\circ$ . 1  
 $\tan 35^\circ \tan 45^\circ \tan 55^\circ$  ගේ ග්‍රහාංශ ග්‍රහාංශ ග්‍රහාංශ .
12. Write the formula for the total surface area of a frustum of a cone using usual notations. 1  
 පේළි ග්‍රහාංශ ග්‍රහාංශ cone අග්‍රාංශ frustum අග්‍රාංශ අග්‍රාංශ surface area ගේ  
 formula නැත .
13. When are events of a random experiment said to be mutually exclusive? 1  
 Random experiment අග්‍රාංශ event ග්‍රහාංශ අරුත සංඛේදන mutually exclusive අරුත  
 තේරුම ?

14. Let  $P(x)$  be any polynomial of degree  $\geq 1$  and let  $a$  be any real number. If  $P(x)$  is divided by the linear polynomial  $x - a$ , prove that the remainder is  $P(a)$ . 2

$P(x)$  යනු degree  $\geq 1$  වන polynomial වෙලාවේ  $a$  උ real number වෙලාවේ දී  $P(x)$   $x - a$  වන linear polynomial වෙලාවේ  $P(a)$  වන remainder වන බව පෙන්වන්න.

15. If  $x^2 + px + q$  and  $x^2 + rx + s$  are both divisible by  $x - a$ , show that  $a = \frac{s - q}{p - r}$ . 2

$x^2 + px + q$  සහ  $x^2 + rx + s$  යන දෙකම  $x - a$  ට බෙදිය හැකි නම්,  $a = \frac{s - q}{p - r}$  බව පෙන්වන්න.

16. If  $a$  be the first term and  $d$  be the common difference of an AP. Show that the  $n^{\text{th}}$  term of the AP is given by  $a_n = a + (n - 1)d$ . 2

AP හි පළමු වන වදන  $a$  සහ common difference  $d$  වන විට AP හි  $n$  වන වදන  $a_n = a + (n - 1)d$  බව පෙන්වන්න.

17. If  $\alpha, \beta$  are the roots of  $2x^2 - 5x + 1 = 0$ , find the value of  $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$ . 2

$2x^2 - 5x + 1 = 0$  හි root වන  $\alpha, \beta$  වල  $\frac{\alpha}{\beta} + \frac{\beta}{\alpha}$  හි අගය සොයන්න.

18. A solid metallic hemisphere of diameter 28 cm. is melted and recast into a number of cones each of radius 7 cm and height 16 cm. Find the number of cones so formed. 2

Diameter 28 cm. වන ගෝලීය අර්ධගෝලයක් මුළු වශයෙන්  $7$  cm radius සහ  $16$  cm height වන cones බවට පරිවර්තනය කරනු ලබන බව පෙන්වන්න.

19. Factorise : 3

Factorise ூ :

$$a^2(b+c) + b^2(c+a) + c^2(a+b) + 2abc$$

20. For any positive integral number  $n$  show that  $n(n+1)(n+b)$  is divisible by 6. 3

$n$  ூ ூ ூ positive integer ூ ூ ூ  $n(n+1)(n+b)$  ூ 6 ூ ூ ூ ூ ூ ூ ூ ூ ூ

21. Solve graphically : 3

Graph ூ ூ solve ூ :

$$2x + y = 8$$

$$x - 3y + 3 = 0$$

22. Prove that the intercept of a tangent between two parallel tangents to a circle subtends a right angle at the centre. 3

Circle ூ parallel ூ tangent ூ ூ tangent ூ ூ ூ (intercept) ூ circle ூ centre ூ right angle ூ ூ ூ ூ ூ ூ ூ

23. Calculate the values of trigonometric ratios of  $45^\circ$ . 3

$45^\circ$  ூ trigonometric ratio ூ ூ ூ ூ

24. If three straight lines are drawn on a white board at random with the eyes closed, show that the probability of forming a triangle is  $\frac{1}{7}$ . 3

White board ூ

25. If  $x, y$  are any real numbers and  $d$ , a positive real number prove that  $|x - y| < d$  if and only if  $y - d < x < y + d$ . 4

$x, y$  ට ඔරොත්තු real number ලිඟ  $d$  ට positive real number ඔරොත්තු  
 ගැනෙහි යථා :

$$|x - y| < d \Leftrightarrow y - d < x < y + d$$

26. A motor boat whose speed is 15 km/hr in still water takes 1 hour longer to go 36 km upstream than to return downstream to the same spot. Find the speed of the stream. 4

රොටුපොත් නලාඟුක ස්ථිත තෙහි ධ්වනි 15 km/hr ඔරොත්තු motor boat ඔරොත්තු නරංචාඟි සෙරෙඟුපොත් 36 km තේළොඟුගොනුට, නරංචාඟි නලොත්තු තේළොඟි සෙසක ස්ථිතතොගොනුඟි 1 hour තෙළුට සරංග රිඟ || නරංචාඟි ස්ථිතතොඟි රෙඟ ගැනෙහි යථා ||

OR/ට45333333

In an auditorium, the seats are so arranged that there are 10 seats in the first row, 13 seats in the second, 16 seats in the third etc. thereby increasing the number of seats by 3 every next row. If there are 64 seats in the last row, how many rows of seats are there in the auditorium? Also find the total number of seats in the auditorium.

Auditorium ඔරොත්තු සෙසෙලාගි සෙචාඟි සඟෙලා, ඔරොත්තු ගොඟුක සෙසෙ 10, ඔරොත්තු ගොඟුක සෙසෙ 13, ඔරොත්තු ගොඟුක සෙසෙ 16 ටරොඟි සෙසෙ ගොඟුක සුනාගික සෙසෙ සලාගි 3 තෙළොඟුට සෙසෙ || ඔරොත්තු ගොඟුක සෙසෙ 64 සෙසෙ auditorium ඔරොත්තු ගොඟුක සෙසෙ ගොඟුක සෙසෙ ටොඟුට || Auditorium ඔරොත්තු සෙසෙ ගොඟුක සෙසෙලාගි ගැනෙහි යථා ||

27. Find the area of a triangle ABC with vertices  $A(x_1, y_1)$ ,  $B(x_2, y_2)$  and  $C(x_3, y_3)$ . 4

$A(x_1, y_1)$ ,  $B(x_2, y_2)$  ඔරොත්තු  $C(x_3, y_3)$  ට vertex ලිඟ ඔරොත්තු triangle ABC ඟා area ගැනෙහි යථා ||

28. State and prove Basic Proportionality Theorem. 5

Basic Proportionality Theorem ඟා රෙඟෙච නරු ඔරොත්තු ගැනෙහි යථා ||

OR/වෙනුවට

If a perpendicular is drawn from the vertex of the right angle of a right triangle to the hypotenuse, prove that the triangles on each side of the perpendiculars are similar to the whole triangle and to each other.

Right triangle ඔබගේ right angle ක්ෂේත්‍රයේ vertex ඉහල perpendicular ඔබගේ hypotenuse ක් පරිච්ඡේදනය කරයි, perpendicular ක්ෂේත්‍රයේ ඒවායේ ඒවායේ triangle ඔබගේ ඔබගේ ඔබගේ triangle සමානව සමානව similar වේ. එබැවින් ඒවායේ සමාන වේ. ||

- 29. Construct a triangle similar to a given triangle ABC with its sides equal to  $\frac{5}{3}$  of the corresponding sides of the triangle ABC. Write the steps of construction. 2+3 = 5

ඔබගේ triangle ABC ක් similar වේ. side මාපය ABC ඔබගේ side මාපය  $\frac{5}{3}$  වේ. triangle ඔබගේ construct වේ. construction ඔබගේ සටහනක් ලෙස.

OR/වෙනුවට

Divide a given line segment AB internally in the ratio 4 : 3. Write the steps of construction.

ඔබගේ line segment AB ක් 4:3 වේ. ratio ක් සඳහා ඒවායේ. construction ඔබගේ සටහනක් ලෙස.

- 30. The pilot of an aeroplane observes that the angle of depression of a kilometer stone on a straight road on a horizontal ground is  $30^\circ$  when his aeroplane is at particular altitude. When he increases the altitude by 300m the angle of depression of the next kilometer stone is  $60^\circ$ . Find the altitude of the aeroplane when the first observation is made. 5

Aeroplane ඔබගේ pilot ඔබගේ aeroplane ඔබගේ altitude ඔබගේ  $30^\circ$  horizontal වේ.  $300\text{m}$  ක් altitude ඔබගේ  $60^\circ$  වේ. altitude ඔබගේ find කරන්න.

31. A cone of height  $H$ , is divided into two parts by a plane through the mid-point of the axis of the cone and parallel to the base. Find the ratio of curved surface area of the conical part to that of the frustum. 6

$H$  ઝેડ cone વાલ, જોઈ axis ઢી જડેડ ડેડડ વાલુ base ઠ parallel વેડડ plane વાલ લુ વાલ ડેડડ લેડડેડ. || cone જવેડાઈ લુ વાલુ વાલુ વાલુ ડેડડેડ area નુ frustum નુ વાલુ ડેડડેડ area વેડડેડ ratio ઠ જુડેડ. ||

32. Find the mean, median and mode of the following distribution : 6  
જડેડ જાલેડ distribution વાલુ mean, median વાલુ mode જુડેડ :

Class	20 - 40	40 - 60	60 - 80	80 - 100	100 - 120	120 - 140	140 - 160	160 - 180	180 - 200
Frequency	6	9	11	14	22	13	10	8	7